SOLID WASTE MANAGEMENT IN OXFORD COUNTY

April, 1980

Ontario Ministry of the Environment

The Honourable
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Minister

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SOLID WASTE MANAGEMENT

IN

OXFORD COUNTY

MINISTRY OF THE ENVIRONMENT
APRIL, 1980

COMPONENTS OF THE WASTE MANAGEMENT SYSTEM

The components of a solid waste management system include:

- collection
- transfer
- source separation
- waste processing
- landfill

The system will invariably include landfill and usually collection, and may also include one or more of the remaining three components.

Solid Waste Collection

Collection of solid waste in Oxford County is the responsibility of its member municipalities. However, since municipal collection vehicles must deliver the waste to a site or sites provided by the County, collection services are influenced by site selection and should be considered by the County in its overall waste management plan. Changes in the location of disposal sites may mean that municipalities have to adjust their collection routes and possibly need more (or less) collection vehicles.

Transfer Stations

When the disposal site or processing plant is located a considerable distance from the point of waste pickup, the cost of transporting waste in the collection vehicles can be very high. The use of a transfer station may reduce the transportation costs since transfer vehicles normally carry the same amount of waste as four or five collection vehicles. As a rule of thumb, when the haul distance exceeds 15 miles one way, the municipality should consider a transfer station as part of the overall waste management system. However, since there are capital and operating costs associated with the construction and operation of

transfer facilities, a careful analysis is required. The facilities can be provided by the municipality or firms which specialize in waste management handling and which can provide assistance in the area including the design, construction and operation of the facilities.

The City of Wallaceburg is operating a transfer station which was essentially designed by and constructed under the supervision of municipal staff. The 1979 cost for a station which handles between 40-80 tons per day was $155,000. Annual operating costs for the station excluding haul are reported to be about $30,000.

Source Separation

Source separation involves the public separating the various components of solid waste for collection. Since the materials have not been mixed with other materials in the waste stream, they are relatively clean and hence are more readily reused. The systems which have been tested in Ontario have been aimed primarily at the household level and have included materials such as cans, glass and newspaper. There are, however, other materials which could be recovered. A list of materials and sources from which they can be separated are:

Material	Source
Newspaper	Residential
Cans	Residential
Glass	Residential, Commercial, Institutional
Corrugated Cardboard	Commercial
Fine Paper	Institutional & Government buildings, offices

The existing secondary materials and scrap metal industry routinely handle such materials as cardboard and iron scrap. There are, however, many sources of these materials which are not regularly served by the secondary material industry because small quantities make it marginally economic.

Options for Collection

Separated materials from domestic sources can be picked up at the curbside or alternatively taken by the resident to depots which have been provided by the municipality. In some communities, a combination of the two approaches may be considered particularly where garbage collection services are not available to 100% of the population. Special arrangements for picking up cardboard and fine papers will probably be necessary since it may be an infrequent service depending on how fast the materials accumulate.

Operation of the System

Source separation systems can be operated by a number of different agencies including:

- municipal staff
- private sector
- community based private sector organizations
- volunteer groups.

Because of the impact which source separation can have on waste collection, many municipalities assume the responsibility for collecting source separated materials. This may not be the most cost-effective method and consideration should also be given to operation by the private sector on a contract basis. Examples of each mode of operation are:

Municipal staff	Halton Hills (Georgetown)
Private sector	Kitchener
Private sector (Community based)	East York (Metropolitan Toronto)
Volunteer group	Richmond Hill

Recovery of Materials

Detailed statistics on recovery rates are not available for a comprehensive cross-section of municipalities. However, data obtained from the Divide and Conquer project ~~(Appendix I)~~ provides a useful comparison of curbside and depot recovery rates for residential separation at source.

TABLE I

QUANTITIES RECOVERED

Material	Units	Aurora	Georgetown
Newspaper	(tons/wk)	3.3	6.4
	(lb/cap/wk)	.45	.71
Glass	(tons/wk)	.74	2.1
	(lb/cap/wk)	.10	.23
Cans	(tons/wk)	.29	1.0
	(lb/cap/wk)	.04	.12
TOTAL RECOVERED:			
Newspaper		297	564
%		76.1	67.1
Glass		67	185
%		17.2	22.0
Cans		26	92
%		6.7	10.9

There is little reported information on the recovery of fine papers and cardboard but the steady market and price which can be obtained for these materials indicate that they should be considered. The recovery of glass from commercial and institutional sources may provide sufficient revenue to support a small private operation without assistance from government.

It must be clearly understood that recovery of materials through separation at source can not eliminate the need for landfill but does reduce to some degree the requirements for landfill.

Waste Processing

There are a number of waste processing options which may be considered from a technical viewpoint. These include:

1) Shredding only with shredded waste landfilled.

2) Shredding for the production of refuse derived fuel (RDF).

3) Incineration.

4) Incinceration with energy recovery.

5) Composting.

Waste processing is more capital intensive than landfill and therefore decisions on these options should be made on the basis of reliable information. It is essential that as much reliable information as possible should be obtained on the following:

a) Waste quantities
b) Waste composition
c) Markets for energy and value of energy recovered
d) Markets for recovered materials and value for each.

At this stage information on waste quantities is of primary importance. Information on waste composition particularly commercial and industrial waste also must be given high priority since the total quantity may be reduced significantly by recovery of material.

Estimating Waste Quantities

In a report carried out for the Ministry and the Waste Management Advisory Board, "Solid Waste Management Cost Accounting System", the consultant developed procedures for estimating waste quantities from truck counts. The detailed procedure is contained in Appendix IV of that report, however, the method is simple and involves three steps:

1) Record the number of trucks entering the site and the appropriate volume for each for a one week period.

2) Using factors provided, convert the total volume to a weight estimate.

3) An annual tonnage figure can be calculated using the appropriate seasonal adjustments which are provided.

A summary of this procedure is provided in Appendix II.

Waste Composition

Information on waste composition is much more difficult to obtain. However, if the main waste streams are considered, it becomes easier to approach the problem. The major waste streams are residential, commercial and industrial.

Residential	Provincial averages for rural and urban populations are adequate.
Commericial	A survey of the major commerical establishments will provide a better estimate of both quantity and composition. For example, is there a high percentage of cardboard and paper waste?
Industrial	Industrial sources may contribute large volumes of inert or bulky wastes which should be identified by means of a survey. It may be advisable to consider weighing the waste from some sources if the quantity is high. Some inert wastes could be taken to special sites rather than landfill.

Shredding Plants

For the purpose of comparison approximate capital and operating costs were prepared from available information. It should be stressed that these are estimates only and more detailed estimates would be necessary before a decision on this type of plant could be made.

Shredding of municipal solid waste is quite often the first step in resource recovery since it has the flexibility of a modular approach and provides some advantages at the landfill site. Two simple plants are compared:

1) Shredding only with recovery of ferrous metals (5%) and the remaining waste (95%) being landfilled.

2) Shredding with ferrous recovery and up-grading to produce RDF. About 45% of the waste by weight will be landfilled.

Capital and Operating Costs

	Shredding Only	Shredding & RDF
Capital Cost	$5,030,000.00	$5,550,000.00
Debt Service (20 yrs. @ 12%)	798,000.00	880,000.00
Operating Costs		
- Wages	187,000.00	187,000.00
- Supplies & Maintenance	342,000.00	377,000.00
Annual Cost	1,327,000.00	1,444,000.00
Unit Costs		
Debt Service	$16.00/T	$17.60/T
Operating Costs	10.58/T	11.28/T
TOTAL	$26.58/T	$28.88/T
Revenue	2.00/T	12.00/T
Net Cost	$24.58/T	$16.88/T

Discussion

1. The calculated operating costs of $10.58/T are higher than the cost of $5.60/T reported by the City of St. Catharines which operates a simpler type of plant.
2. As the price of energy increases at a rate faster that operating costs, the net cost of operation becomes less.
3. Operating capacity: 29 tons per hour
   : 200 per day
   : 50,000 per year
4. Employees : 10
5. Revenue for RDF is based on:
   1 ton of garbage = 1/2 ton of RDF
   RDF @ 5,000 BTU/lb and the energy selling for $2.00 per million BTU's.
6. The cost of landfilling the residue (45%) has not been included.

Modular Incinerator Plants

Incinerators which are suited for smaller municipalities are commonly called modular incinerators. Other common names are controlled air or starved air incinerators since the amount of combustion air is closely regulated. These units usually consist of a primary chamber where the solids are burned and a secondary chamber where the final combustion takes place, with the aid of auxiliary fuel either gas or oil. These units have a capacity of one-half ton to four tons per hour.

The larger systems include features such as automatic loading, ash removal and heat recovery boilers. The volume of waste is reduced by 90% and the weight is reduced by 70%.

Capital and Operating Costs

	Without Energy Recovery	With Energy Recovery
Capital Cost	$5,900,000.00	$7,000,000.00
Debt Service (20 yrs. @ 12%)	935,000.00	1,110,000.00
Operating Costs		
- Wages	216,000.00	288,000.00
- Supplies & Maintenance	105,000.00	150,000.00
Annual Cost	1,256,000.00	1,538,000.00
Unit Costs		
Debt Service	$18.70	$22.20
Operating Costs	6.42	10.76
TOTAL	$25.12	$32.96
Revenue		13.00
Net Cost	$25.12	$19.96

Discussion

1. Capital costs are based on 4 units with each rated at 50 tons per day.
2. Plant operation is 24 hours per day and 5 days per week.
3. Steam revenue is based on a steam price of $2.30 per 1000 # or fuel equivalent.

4. If the incinerator was able to operate on a 7 day schedule, the annual capacity would increase from 50,000 tons to 70,000 tons. The net operating cost would be reduced to about $15.00 per ton.
5. As energy prices escalate at rates higher than wages and maintenance, the net operating cost becomes lower.

Operating Plants

Location	Capacity
North Little Rock, Arkansas	100 TPD
Salem, Virginia	100 TPD
John Deere Plant, Waterloo, Iowa	100 TPD

Compost Plants

Composting may be defined as the biological decomposition of organic waste under controlled conditions to produce a humus material which may be safely applied to land. Most compost processes are aerobic (addition of air) in order to reduce odour problems and also for public health and crop safety since the aerobic process results in higher temperatures.

Although there are several different composting methods, all require some form of size reduction and separation of materials such as glass, metals and plastics. The basic methods of composting are:

- mechanical composting in specially designed reactors
- windrow composting in piles outdoors
- vermiculture or the use of earthworms which digest the organic waste.

It should be noted that there is limited North American experience on mechanical composting and windrow composting and vermiculture has been applied to sewage sludges rather than municipal solid waste.

Reliable information on the cost of composting and the real value of compost to potential users is lacking. Since the income is uncertain, capital and operating cost estimates for composting have not been provided. Valuable information will be available from the Ministry's compost

plant both on operating costs as well as markets and value to users. Discussions are underway with a private firm in Northumberland County for the construction and operation of a privately financed compost plant. If the initial plant is successful, there could be an interest in building similar plants elsewhere in the Province.

Project Development and Financing

The development of any project should proceed through certain well-defined stages.

First, a preliminary assessment will be carried out to determine if certain basic criteria are met which are considered necessary if a project is to be potentially viable.

This report essentially covers that first stage assessment.

If a decision is made to proceed further, an engineering and economic study should be carried out to provide more detailed and more accurate information. The cost of such a study, in this case, is likely to be in the order of $30,000.00 to $40,000.00. Financial assistance up to 50% of the study cost may be available, subject to entering into a preliminary agreement including acceptable financial criteria, and a commitment to proceed if these criteria are met.

The procedure for further development will depend on the results of this study, and a decision on the means of contract procurement, for example, by consultant design, contractor construction and municipal operation, or at the other extreme, by a full-service contract with a private company for design, construction and operation.

Financial assistance for these later stages may also be available but is dependent on the circumstances of each individual case.

Discussion

The most urgent priority for the County is the need to obtain a landfill disposal site for use both in the short and long term. This question is not addressed directly in the report but it must be emphasized again that neither source separation, waste processing nor a combination of both, will eliminate the County's need for a new landfill site. However, such measures can certainly reduce the volume of waste to be landfilled, thus increasing the life of a site, and, depending on the process selected, may substantially reduce any pollution or nuisance potential.

If the County wishes to pursue the possibility of establishing a waste processing facility, of whatever kind, it is essential that more accurate estimates of the quantity of waste produced are obtained, in various categories. As soon as possible, therefore, a survey should be carried out using the truck counting procedures described in the report. In addition, the larger commercial industrial and institutional sources should be surveyed to determine in particular whether significant quantities of potentially recoverable material (corrugated, fine paper, glass, for example) or non-processible material are produced.

With regard to source separation, additional efforts by the groups presently involved should be encouraged. However, further action in this area should, in our view, be temporarily deferred until Ontario Paper's plans to develop a recovery network for waste news in Ontario are further advanced. Waste Management Branch staff will be working with Ontario Paper, and municipalities, over the next few months on this program. In addition, the Ministry will be examining the potential for combining news recovery with the recovery of other materials such as corrugated, fine paper and glass through a regional source separation system incorporating intermediate handling stations. It may be possible to design any facility set up for waste processing so that these functions can be included.

The lack of a suitable energy market in the area, and the comparatively high cost of incineration without an energy income, reduces the practicability of this option.

Reliable information is at present not available either on the real value of compost from municipal waste to potential users or on the capital and operating costs of small composting plants. Demonstration projects to be carried out this spring and summer, and a planned tour of small composting plants in Europe, will provide useful guidance on both aspects. However, at this stage, a recommendation to develop a composting plant could not be justified.

A similar comment must be made on a plant to produce RDF. The three week continuous test run just completed at Canada Cement at substitution rates up to approximately 40%, gives reason for optimism, subject to satisfactory test results on air emissions and clinker quality. Further work must be carried out, however, before the company can be expected to consider any commitment to purchase RDF for continuous use.

The most promising approach for the County would appear to be a staged development. In the first stage, the waste would be shredded, and the shredded waste disposed of by landfill. Ferrous metals could be recovered by magnetic separation and possibily other material such as corrugated by hand sorting. The facility might also incorporate the space and equipment required for its use as an intermediate handling station for news, corrugated, fine paper and glass recovered by source separation throughout the County.

Apart from the advantages described for a shredded waste landfill, such a facility could be designed so that the production of either RDF or compost could be added as a second stage.

Proposed Action Program

1. Proceed with the acquisition of landfill capacity required.
2. Encourage expansion of existing source separation activities.
3. Carry out waste survey to obtain more accurate estimates of quantity and composition.
4. Enter into an agreement with the Ministry to carry out a jointly funded preliminary engineering study on waste shredding plant and shredded waste landfill.
5. Maintain continuing liaison with Ministry so that further action can be considered when the necessary information is available on:
   1) Waste news for Ontario Paper Company
   2) RDF markets
   3) Composting technology and markets.

DIVIDE AND CONQUER
SOURCE SEPARATION PROJECTS

Introduction

"Divide and Conquer" is the theme of a Ministry of Environment program initiated in 1978 to develop information about source separation. This information will be used to define the potential contribution of source separation in solving waste management problems in Ontario. The program consisted of a project in each of the municipalities of Georgetown, Aurora, City of Toronto and Borough of Etobicoke.

Each municipality was asked to operate a system allowing local residents to separate newspaper, glass bottles and cans from their waste for eventual recycling instead of disposal. The projects included several methods of curbside pickup as well as a depot system.

Communication Approach

The Ministry hired a consulting firm to develop and implement a communication program to be used in each community. There were three main components in this program: media-type communications, an educational program and local participation.

Home delivery of communications were made to households in the project area to initiate the collections. These materials introduced the common "Divide and Conquer" theme and recycling logo.

The first message was distributed in the form of a "teaser" (Fig. 1) to arouse interest. This was followed by a sturdy "sampler" (Fig. 2) which provided instructions to the householder on how to separate and prepare the three materials. It was suggested to the householder to keep the "sampler" as a visual reminder of the program. Approximately 2 months after the first collection each household was sent a reminder in the form of a "recycled" brochure (Fig. 3) with further messages aimed at persuading the householder to participate in the project.

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In addition to these home delivered communications, advertisements were placed in local community newspapers to reinforce the basic theme and instructions. Large posters were distributed to local groups and put up in various public areas such as stores and municipal buildings.

A "Teachers Kit" was produced and distributed to teachers in local schools. Its purpose was to provide background information and classroom activities on the broad topic of solid waste. A slide program was also prepared for Georgetown and Aurora to be made available to local groups who could use the presentation to promote the project.

The common objective of these various communication approaches was to persuade the householders to participate in their community's new method of waste management. To evaluate the success of the approaches taken and to gain some understanding of public attitudes and behaviour concerning source separtion, a survey was conducted in each area by the Ministry's consultant. The results indicated a widespread awareness and acceptance of source separation in the project areas.

Description of Collection Systems

Georgetown - The project area consisted of the entire town with a population of 18,000 people in approximately 5,000 households. Curbside pickup on a once per week basis was provided for each household. A two man crew using a high volume van collected the three recyclable fractions which were put out on the same day as regular garbage pickup. During the summer months when regular garbage was picked up twice per week, the separate pickups were made on the same day as the first regular garbage pickup.

Wheeled containers inside the van held the glass and cans until a full load was picked up, at which time the crew returned to the municipal works yard to transfer the materials to large bulk lift containers. When full, these containers were delivered to appropriate markets by a contracted hauler.

City of Toronto - The project area consisted of one route from a regular collection district. This included approximately 1000 households with a population of 3500 people. Curbside pickup on a once per week basis was provided for each household. Two crews of two men each picked up the separated materials each Wednesday. One crew picked up newspapers only, using a rear loading packer truck. Since separate newspaper pickup is provided for the whole city, this crew would service the project area then continue with the remainder of its assigned area.

A second crew using a single axle open dump truck would collect glass and cans. The truck box was partitioned to keep the materials separate when loading. Both crews returned to central works yards to unload into large bulk lift containers. Metropolitan Toronto markets all recovered materials for the individual Boroughs through tendered contracts.

Aurora - The project area consisted of the entire town with a population of 14500 in approximately 4000 households. The Town set up depots in the local shopping malls and other public areas. The depots are unmanned and anyone can drop off newspaper, glass and cans at any time.

Each depot consists of at least two separate compartments for newspaper and one each for glass and cans. Wheeled containers inside the compartments hold the materials deposited by the public.

A two man crew services all depots six days per week with a 3/4 ton pickup truck equipped with a power tailgate. Empty containers are exchanged for full ones which are transported to the works yard. Glass and cans are stored in bulk lift containers for later shipment to market. Newspaper is delivered directly to a local insulation manufacturer.

Etobicoke - The project area consisted of 1300 households with a population of approximately 4500 people. The area was one of two which had already been provided with separate pickup of newspaper and glass.

The area was serviced on a once per week basis by a three man crew using a rear loading packer and trailer combination. Newspaper was loaded into the packer while glass and cans were put into the trailer.

Full loads were transported to a central works yard for storage as in other systems.

Participation

The curbside collection areas were monitored for the entire project duration. The crews recorded the date, address and type of material whenever a household participated. This level of monitoring has allowed us to develop an accurate picture of public behaviour during the projects. Together with measurements of public attitudes we can begin to make some assessments of source separation.

One means of assessing participation is to count the number of households putting out separated materials on any given collection day. Table 1 lists the weekly participation rates as a percentage of the total number of households in the project areas. These rates are useful to the operators of a source separation system since they provide an indication of the work load which can be expected.

Another aspect of the participation rate is illustrated by Table 2 which lists for the City of Toronto project the combinations of materials which were put out as a percentage of the total pickups for the collection.

Although participation in any given week is important, it is just as important to obtain long term cooperation from the public. Fig. 3 shows for the City of Toronto project, the percentage of households in the study area which have participated a given number of times.

Recovery

The main objective of source separation, from a waste management point of view, is to recover the major portion of any recoverable material.

As part of the City of Toronto project, a study was conducted to measure the extent to which this objective was achieved. The study involved collecting, sorting and weighing all waste generated in a sample of households over a ten week period.

Table 4 shows the amounts of newspaper, glass and cans recovered as a percentage of the total amounts of these materials found in the waste generated. This percentage is defined as the recovery rate.

Comparison of Table 4 and Table 1 shows the recovery rate is not the same as the weekly participation rate because not everyone participates every week.

The quantities recovered on a weekly basis were recorded and the results in Table 5 illustrate the level of material flow in each project area. The Aurora depot system recovered less per person in total than the curbside systems however, glass and can recovery appears comparable to the Toronto system. Newspaper is by far the largest component of the amount collected making up 70% of the total quantity recovered. Glass and cans contributed 20% and 10% respectively to the total.

Costs

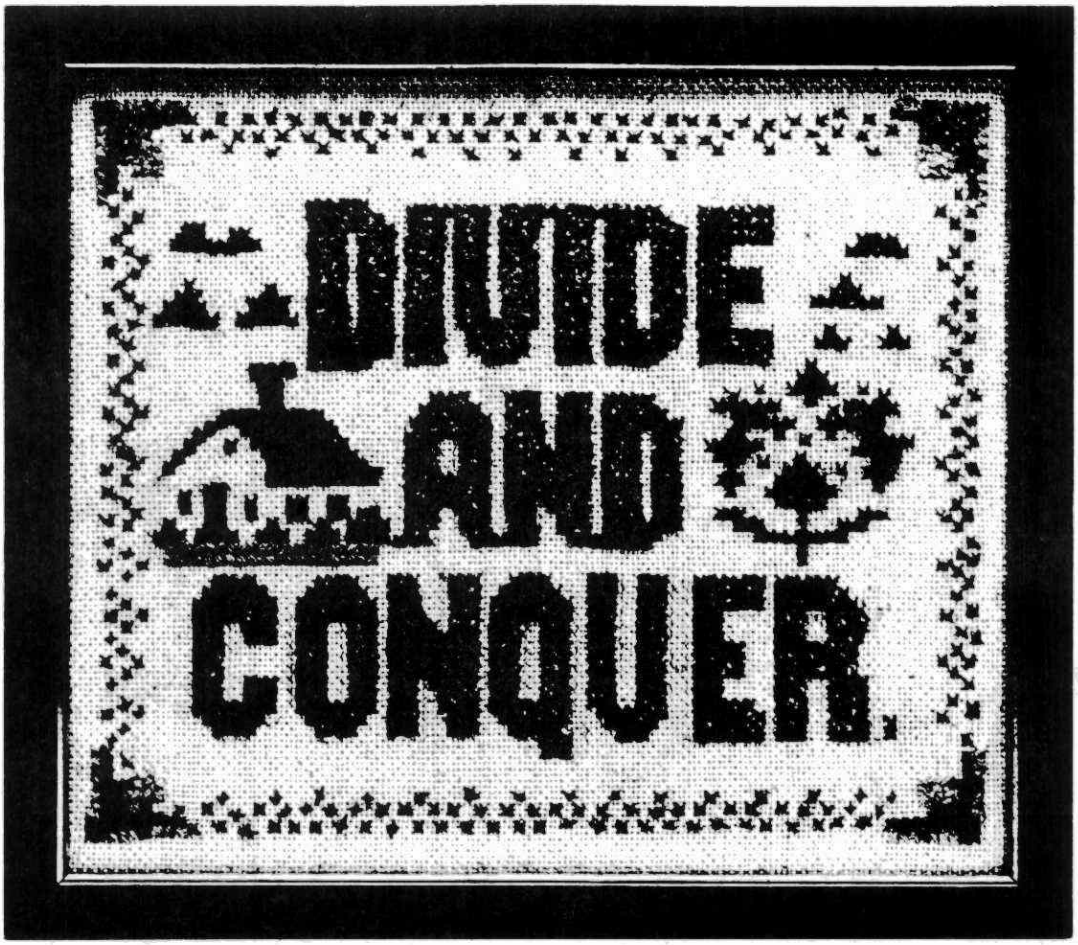
Recovering waste through source separation is a more expensive activity than regular collection and disposal in the project areas which we monitored. Table 6 provides a summary of the financial aspects of the systems. It shows the costs and revenues which were incurred as a result of the source separation activities.

The costs for the Toronto project were allocated on a time basis for the manpower and equipment used. The men and equipment were assigned from existing resources, therefore the costs shown are actual costs and not incremental costs. The expenditures in Georgetown and Aurora are incremental because equipment and manpower in most cases had to be acquired.

The net costs ranges from 3 to 4 times the regular collection and disposal activity. Georgetown and Aurora systems are complete systems in that the entire towns are included, therefore the financial structure is more typical of an actual ongoing operation. These communities in fact, are continuing with source separation as there is some potential for improving the economic picture through operational changes.


THE FIGHT IS ABOUT TO BEGIN AND WE'D LIKE YOU TO TAKE PART.
NEXT WEEK, YOU AND YOUR NEIGHBOURS GO INTO ACTION AGAINST THE ENEMY.
The enemy is right in your home.
In every home in your neighbourhood.
It assumes many shapes.
And one day soon, it could get out of hand.
So there's little time to lose.
We're not asking for your money. Not a penny.
We're just asking you and your friends for a little of your time and effort.
It's for the good of your children. Your family. Your community.
In a few days you will receive instructions about how to stop the enemy in its tracks.
WE'RE COUNTING ON YOU.
DIVIDE AND CONQUER
A MESSAGE FROM THE MINISTRY OF THE ENVIRONMENT AND YOUR LOCAL MUNICIPALITY
PRINTED ON RECYCLED PAPER.

FIGURE 1



RECYCLING BEGINS AT HOME.

DIVIDE AND CONQUER.
Paste it up in your kitchen.
Stick it on your fridge. Over the sink or stove. Put it anywhere to remind you how to win the battle against garbage.
You see, our community could continue to fill up holes in the ground with our garbage and cover it over and forget it.
But that's a waste. We're burying a lot of resources that could be reused.
That's why there's not a moment to lose.
Our community can start reusing its garbage.
Right now.

HERE'S HOW TO DIVIDE AND CONQUER.

1. When you're through with bottles, cans and newspapers (no magazines, please), put them in separate containers.
   Containers to USE: Cardboard boxes, plastic shopping bags, paper bags, garbage cans and anything that isn't sealed.
   Containers NOT to USE: Anything that is sealed, such as garbage bags.
2. Rinse bottles and cans first. (Please leave bottle tops off.) Put bottle tops and can lids in the "CANS" container.
3. Put everything out on collection day.
   That's all there is to it!

DIVIDE AND CONQUER. NOW.
The first collection for your area will be next week.
So do your part.
Think of it this way. You and your neighbours can help our community reclaim some of Canada's precious reusable natural resources.
Or you can let them be lost forever, buried in some hole somewhere.
For more information about any part of the program phone: 877-5185.

PUT EVERYTHING OUT ON COLLECTION DAY.

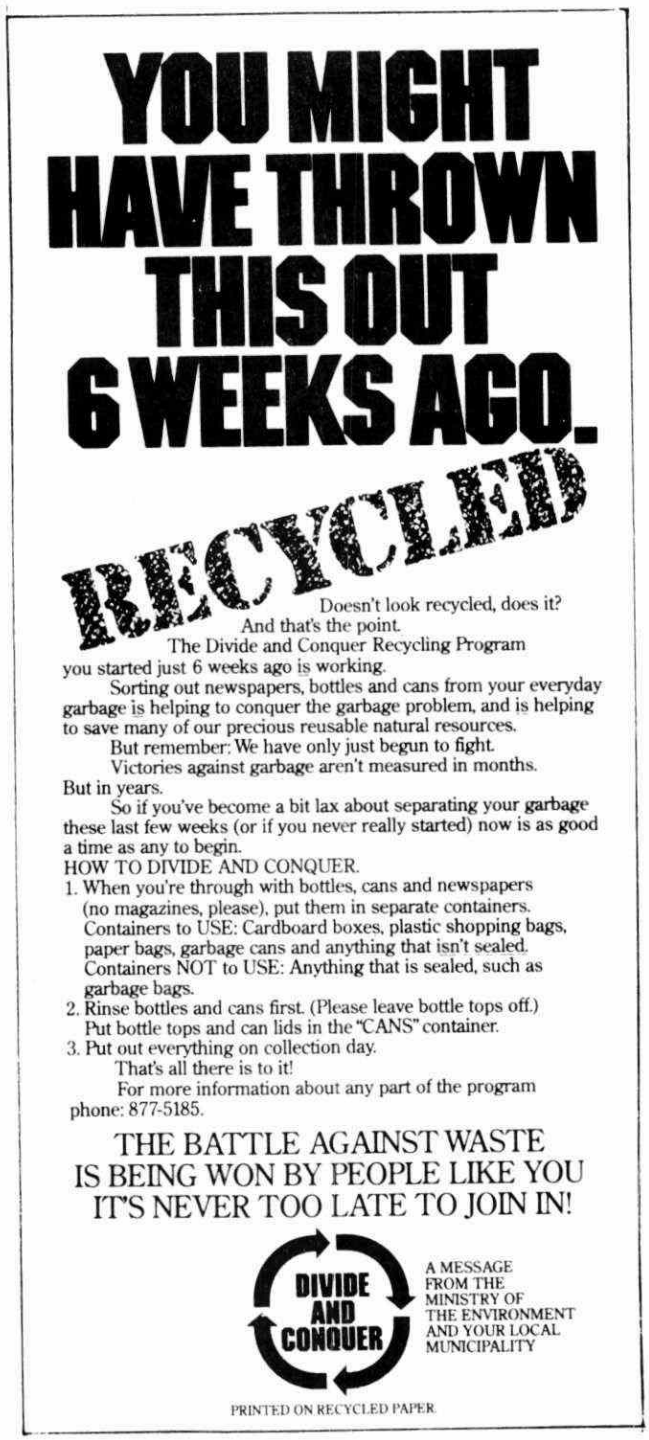
THE BATTLE AGAINST WASTE HAS BEGUN. JOIN IN.

DIVIDE AND CONQUER

A MESSAGE FROM THE MINISTRY OF THE ENVIRONMENT AND YOUR LOCAL MUNICIPALITY

PRINTED ON RECYCLED PAPER.

FIGURE 2



YOU MIGHT HAVE THROWN THIS OUT 6 WEEKS AGO.

RECYCLED

Doesn't look recycled, does it?
And that's the point.
The Divide and Conquer Recycling Program you started just 6 weeks ago is working.

Sorting out newspapers, bottles and cans from your everyday garbage is helping to conquer the garbage problem, and is helping to save many of our precious reusable natural resources.

But remember: We have only just begun to fight.

Victories against garbage aren't measured in months. But in years.

So if you've become a bit lax about separating your garbage these last few weeks (or if you never really started) now is as good a time as any to begin.

HOW TO DIVIDE AND CONQUER.

1. When you're through with bottles, cans and newspapers (no magazines, please), put them in separate containers.
   Containers to USE: Cardboard boxes, plastic shopping bags, paper bags, garbage cans and anything that isn't sealed.
   Containers NOT to USE: Anything that is sealed, such as garbage bags.
2. Rinse bottles and cans first. (Please leave bottle tops off.)
   Put bottle tops and can lids in the "CANS" container.
3. Put out everything on collection day.

That's all there is to it!

For more information about any part of the program phone: 877-5185.

THE BATTLE AGAINST WASTE
IS BEING WON BY PEOPLE LIKE YOU
IT'S NEVER TOO LATE TO JOIN IN!

DIVIDE AND CONQUER

A MESSAGE FROM THE MINISTRY OF THE ENVIRONMENT AND YOUR LOCAL MUNICIPALITY

PRINTED ON RECYCLED PAPER

FIGURE 3

TABLE 1

WEEKLY PARTICIPATION RATE FOR CURBSIDE COLLECTION

	PARTICIPATION		
	Etobicoke	Georgetown	Toronto
Maximum (%)	33.3	29.8	35.6
Minimum (%)	12.0	6.3	1.7
Average (%)	24.3	20.5	19.5
Number of Weeks	14	88	93
Population	4500	18000	3000
Households	1302	4891	984

NOTE:

1. Participation rate is defined on a weekly basis as:

$$\frac{\text{Number of households separating}}{\text{Total number of households}} \times 100$$

TABLE 2

CITY OF TORONTO

MATERIAL COMBINATIONS PUT OUT

FOR SEPARATE COLLECTIONS

MATERIAL COMBINATION	Percentage of Weekly Pickups		
	MAXIMUM	MINIMUM	AVERAGE
Newspaper only	78.3	41.1	61.5
Glass only	12.7	0.0	3.5
Cans only	13.9	0.0	3.5
Newspaper + glass	11.7	0.0	5.2
Newspaper + cans	10.6	0.0	6.2
Glass + cans	20.4	3.6	7.7
Newspaper + glass + cans	21.1	4.4	12.5

NOTE:

1. Percentage is calculated on a weekly basis as:

$$\frac{\text{Number of households with the given combination}}{\text{Total number of households participating}} \times 100$$

2. Number of weeks in sample is 93.

TABLE 3

CITY OF TORONTO

PARTICIPATION FREQUENCY BY TYPE OF MATERIAL

NUMBER OF WEEKS PARTICIPATED	Material Category							
	NEWSPAPER		GLASS		CANS		ANY	
	NO.	%	NO.	%	NO.	%	NO.	%
1 - 5	289	29	331	34	273	28	273	28
6 - 10	118	12	81	8	57	6	107	11
11 - 15	113	11	58	6	50	5	107	11
16 - 20	82	8	33	3	31	3	73	7
21 - 25	67	7	23	2	19	2	69	7
26 - 30	50	5	10	1	18	2	49	5
31 - 35	42	4	16	2	20	2	55	6
36 - 40	29	3	7	1	6	1	36	4
41 - 45	27	3	9	1	3	*	39	4
46 - 50	16	2	4	*	7	1	22	2
51 - 55	14	1	2	*	5	1	16	2
56 - 60	13	1	1	*	5	1	15	2
61 - 65	18	2	2	*	1	*	19	2
66 - 70	9	1	1	*	2	*	16	2
71 - 75	1	*	0	0	2	*	7	1
76 - 80	1	*	1	*	1	*	3	*
81 - 85	1	*	0	0	0	0	1	*
86 - 90	0	0	0	0	0	0	0	*
91 - 95	0	0	0	0	0	0	0	*
TOTAL PARTICIPANTS	890	90	579	59	500	51	907	92

NOTE:

1. * means less than 1%.

TABLE 4

CITY OF TORONTO

RECOVERY RATE

MATERIAL	QUANTITY RECOVERED AS A PERCENTAGE OF THE QUANTITY AVAILABLE	QUANTITY RECOVERED AS A PERCENTAGE OF THE TOTAL WASTE GENERATED
Newspaper	64.0	7.8
Glass	11.0	0.7
Cans	10.0	0.3
Total	42.0	8.8

NOTES:

1. Materials consumed in the household or removed by other than regular collection or separate collection, were not included in the analysis.

2. The sampling period consisted of 10 weeks between June 25, 1979 and August 27, 1979,

3. Sample consisted of 50 households selected at random from the total project area.

TABLE 5

QUANTITIES RECOVERED

MATERIAL	UNITS	Project Area			
		AURORA	ETIBICOKE	GEORGETOWN	TORONTO
Newspaper	(tons)	297	52	564	136
	(tons/wk)	3.3	3.7	6.4	1.5
	(%)	76.1	69.1	67.1	87.2
	(lb/cap/wk)	.45	1.66	.71	.97
Glass	(tons)	67	22	185	15
	(tons/wk)	.74	1.6	2.1	.20
	(%)	17.2	28.8	22.0	9.9
	(lb/cap/wk)	.10	.69	.23	.11
Cans	(tons)	26	1.7	92	5
	(tons/wk)	.29	.10	1.0	.10
	(%)	6.7	2.2	10.9	2.9
	(lb/cap/wk)	.04	.05	.12	.03
Total	(tons)	390	75.8	839.8	155.9
	(tons/wk)	4.3	5.4	9.5	1.7
	(%)	100.0	100.0	100.0	100.0
	(lb/cap/wk)	.60	2.4	1.06	1.11

NOTE:

1. The quantity of material is approximate as in some cases it was necessary to estimate the weight from the volume.

TABLE 6

FINANCIAL SUMMARY

APRIL/78 TO DECEMBER/79

	Project Area					
ITEM	AURORA		GEORGETOWN		TORONTO	
Labour	14281	36.61	31339	40.91	9947	63.76
Equipment	12147	31.15	17319	22.60	2864	18.36
Shipping	670	1.72	10906	14.24	-	0.
Overhead	4280	10.97	10969	14.32	2524	16.18
Total Costs	31378	80.46	70533	92.08	15335	98.30
Newspaper Sales	7425	19.04	10745	14.03	3065	19.65
Glass Sales	1675	4.29	4399	5.74	375	2.40
Can Sales	130	.33	1277	1.68	15	.10
Landfill Credit	1950	5.00	4568	5.96	-	0
Total Revenues	11180	28.67	20989	27.40	3455	22.15
Net Cost ($)	20198		49544		11880	
Quantity Recycled (T)	390		766		156	
Net Unit Cost ($/T)	51.79		63.85		76.15	

NOTES:

1. Startup, advertising costs not included.

2. Etobicoke data not reported because of insufficient operating period.

TRUCK COUNTING PROCEDURES

SOURCE: SOLID WASTE MANAGEMENT

COST ACCOUNTING SYSTEM

October 1979

TRUCK COUNTING FORMS AND PROCEDURES

These forms and procedures are for use by non-weighing municipalities so that they are able to project the annual solid waste tonnage either collected or disposed of. Four basic forms are provided as follows:

- Sample Truck Count - DAILY LOAD COUNT
- Sample Truck Count - WEEKLY LOAD COUNT SUMMARY
- Sample Truck Count - WEEKLY TONNAGE ESTIMATE
- Calculation of Annual Tonnage Using Sample Truck Count Data.

Details of the procedure for completion of the above forms follow.

1. Daily Load Count (See Table 1 for Example)

This form is used daily to collect the basic count of sizes and types of vehicles in the sample. Basic data required is as follows:

- Name of municipality, sample period, type of truck count being carried out (e.g., for collection or disposal operations), and the location of the count.

- The type of vehicle being counted, as follows:

  - RLP = Rear Loading Packer
  - SLP = Side Loading Packer
  - FLP = Front Loading Packer
  - SP = Stationary Packer
  - R-Off = Roll Off Box
  - S-Box = Lugger Box
  - SA = Single Axle Truck
  - DA = Dual Axle Truck
  - Misc. & 1/2 tons are as stated
  - T/T = Tracter Trailer
  - S/T = Stake Truck and Panel Vans

  These vehicle types are entered in column 1 on the form.

- Vehicle types are segregated in Column 1 by operator category and type of waste:

  - Municipal vehicles (compacted)
  - Municipal vehicles (loose)
  - Contractors vehicles (compacted) - (Contractor working for a municipality)
  - Contractors vehicles (loose)
  - Private vehicles (compacted)
  - Private vehicles (loose)

- The vehicle capacities (e.g. 20 cubic yards) are entered in column 2.
- The individual loads are recorded in column 3 as vehicles are counted.
- The number of loads are totalled daily in column 4, and a grand total of loads (172) is calculated.

2. Weekly Load Count Summary

This form summarizes the daily load counts so that they can be totalled and cross-added. In the example, the daily load counts (172 loads) prepared on Table 1 are summarized onto this form in column 3. The load counts from subsequent days are then entered in columns 4 to 9 and totalled in column 10 (932 loads).

3. Weekly Tonnage Estimate

This form is used to convert the weekly load counts into a total estimated weight for the week. Basic procedural steps are as follows:

- Carry forward the basic vehicle type and capacity data from Table 2 (columns 1 and 2)
- Carry forward the total weekly load counts from column 10 on Table 2.
- Calculate the total number of cubic yards in the sample by multiplying the number of loads by the vehicle capacities (column 2 x column 3 to give column 4).
- Enter the standard province-wide density factors in Column 5 (from Table 3 of the report).
- Calculate the total weight in kilograms in column 6 (column 4 x column 5)
- Group the total weights in column 7 by operator and type of waste (e.g., municipal/compacted), i.e., by broad categories.
- Enter the seasonal density adjustment percentage in column 8 (percentages taken from Table 4 in the report)
- Calculate the adjusted total weight in kilograms (column 9 = column 7 x column 8) and total the estimated weight (e.g., 2,801,888, kilograms)

4. Calculation of Annual Tonnage Estimate, Using Sample Truck Count Data

In Table 4 we show how the adjusted weekly sample weight (adjusted for seasonal density changes) is converted into an annual tonnage estimate using annualization factors. Key steps in the procedure are as follows:

- In "sample #1" box, the month and duration of sample are entered, and the seasonal adjustment factor (one week in May versus total year) is entered from Table 3 in Appendix I, Schedule D, of the report (2.06% in this case)
- The adjusted total sample weight of 2,801,888 KG (from Table 3) is entered in the sample #1 box.
- This total weight is then pro-rated up to give an annual estimate of tons (136,014 tonnes)
- Example figures are entered in sample boxes #2 and #4, and the results are averaged (135,427 tonnes) and stated in tons (149,281) at the bottom of the form.

The average tons are then used on the municipal form that is input for the provincial report.

TRUCK COUNTING EXAMPLE - SMALL RURAL TOWNSHIP

To test the ease with which truck counting techniques could be applied, the concept was tested in February and May, 1979, at a small rural township. Using a simple form (developed when the initial design phase of the costing system was underway), truck counts were made (see Table 1 for an example of the original form). Subsequently, these counts were summarized, and preliminary density factors were applied to give an estimated weekly weight (see Table 2 for examples). The weekly weights were then projected into an annual tonnage figure, in this case taking specific account of summer population increases (see Table 3).

The calculations were reviewed with the municipal staff and were readily comprehended. Subsequently, the forms and procedures for truck counting were updated (see Section A of this Appendix) to allow seasonal density adjustment percentages to be applied.

DATE	REAR END PACKER TRUCK	FORK LIFE PACKER	PRIVATE COLLECTOR ED. HANDY	STAKE TRUCKS (1 TON)	DUMP TRUCKS	1/2 TON TRUCKS	STATION WAGONS	CARS	TRACTOR & WAGON	CAR & TRAILER	OTHER	REMARKS
FEB. 12 MONDAY	1		1→B 1→B 1→B 1→M.L.	1→M.L 1→Garbage 1→M.L.	1→Garbage 1→Fille	1→3 1→4−B 1→M.L. 1→M.L. 1→1−B	1→1=B 1→9=B 1→2=B 1→15=B	1→1=B 1→5=B 1→3=B 1→1-B	1→M.L.	1→3=B 1→M.L. 1→20=B		B→means Bags M.L. = means Mixed Loads
												WDS Closed - Collectors with key.
												WDS Closed - Collectors with key.
	1		4	3	2	5	4	4	1	3		TOTAL 27

APPENDIX IV
SECTION B
TABLE 1

TRUCK COUNTING SAMPLE - SMALL RURAL TOWNSHIP (WEEK ENDING FEBRUARY 17, 1979)

* PRELIMINARY ESTIMATE

SUMMARY OF VEHICLE TYPES AND LOADS

TYPE OF VEHICLE	DAY OF WEEK						TOTALS					WEIGHT ESTIMATE	TOTAL* WEIGHT LBS.
	MON	TUES	WEDS	THURS	FRIDAY	SAT	VEHICLES	YARDS	RES. LOAD	MIXED LOAD	BAGS		
RLP 20 Yards													
- Trips	1	2	1	-	1	-	5						
- Loads	20 yd	20 yd	20 yd		20 yd			100				(268kg) 591 lb. yd.	59,100
1 Ton Truck													
- Trips	4	4	-	-	2	-	10						
- Loads	3B 1M	3B 1M			2B				8	2		(M2240 lb)	4,480
												(R1120 lb)	8,960
1 Ton Stake													
- Trips	3	2	-	-	3	2	10						
- Loads	1B 2M	2B	-	-	2B 1M	1/10B 1M			4	4		(M2240 lb)	8,960
												(R1120 lb)	4,480
5 Ton Dump Truck													
- Trips	2	1	-	-	1	-	4						
- Loads	1B 1F	1F			1M				1	1		(R4200 lb)	4,200
1/2 Ton Truck										2F		(M8400 lb)	8,400
- Trips	5	4	-	-	8	22	39					(F11200 lb)	11,200
- Loads	8B 2M	12B 2M			29B 1M	68B 8M						(M1120 lb)	14,560
										13	117	(B 20 lb)	2,340
Station Wagon													
- Trips	4	2	-	-	4	7	17						
- Loads	27B	11B			17B	33B					88	B 20 lb	1,760
Cars													
- Trips	4	6	-	-	6	17	33						
- Loads	10B	20B			19B	57B 6M				6	106	(M100 lb)	600
												(B 20 lb)	2,120
Tractor & Wagon													
- Trips	1	-	-	-	1	-	2						
- Loads	1M				1M					2		M 500 lb	1,000
Car & Trailer													
- Trips	3	1	-	-	1	2	7						
- Loads	23B 1M	1M			1M	1M				4	32	(M 500 lb)	2,000
												(B 20 lb)	640
												(50 tons)	134,800

APPENDIX IV
SECTION B
TABLE 2

TRUCK COUNTING SAMPLE - SMALL RURAL TOWNSHIP

CALCULATION OF ANNUAL SOLID WASTE TONNAGE

	# Tons
1. Resident Population - All Year	
• Estimated weight of one week truck counting sample in February 1979 = 60 Tons	
• Factor for 1 week in February from Metropolitan Toronto is 1.70%	
• Estimated annual tonnage for resident population	
$60 \text{ Tons} \times \frac{100.0}{1.7\%} =$	3,529
2. Summer Population	
• Extra 5 loads by 20 cubic yard packer = 59,100 lbs per week	
• From mid-May to mid-September, say 16 weeks	
• Estimated additional summer tonnage 16 x 59,100	422
Total Estimated Annual Tonnage	3,951

PROVINCE WIDE, INTERIM DENSITY FACTORS

DENSITY PROGRAM - INDIVIDUAL VEHICLE DENSITIES

(95% Confidence Level for Prediction Within the Upper and Lower Limits)

	% Spread from the Mean	Total Vehicle Load			KG Per Cubic Yard
		Upper Limit	Mean	Lower Limit	
RLP-M (20)	±16.9	5,074	4,339	3,605	217
RLP-M (25)		8,586	4,877	1,168	195
FLP-M (30)	± 2.0	6,088	5,966	5,844	199
FLP-M (36)		16,854	8,299	-396	231
RLP-C (20)		7,618	4,987	2,356	249
RLP-C (25)		16,567	7,422	-1,723	297
FLP-C (36)		14,211	6,144	-1,923	171
RO-C (30)		4,178	3,015	1,852	102
RO-C (40)		7,312	3,217	-874	80
RLP-P (20)		5,069	3,600	2,123	190
FLP-P (30)		6,825	5,355	3,885	179
FLP-P (34)		12,303	7,081	1,859	208
FLP-P (35/36)		10,321	6,364	2,403	179
FLP-P (40)	±14.4	6,763	5,908	5,053	148
SP-P (20)		7,368	3,894	420	195
SP-P (40)		8,245	4,855	1,465	121
LB-P (12)		3,927	2,771	1,615	231
LB-P (14)		3,419	1,680	-59	120
LB-P (20)		6,695	2,518	-1,659	126
RO-P (10)		3,062	1,823	584	182
RO-P (14)		4,336	2,312	288	165
RO-P (20)		5,099	2,789	479	139
RO-P (25)		4,116	2,356	596	94
RO-P (30)		3,920	2,527	1,134	84
RO-P (35)		10,505	2,291	-5,923	65
RO-P (40)		3,673	2,656	1,639	66

SEASONAL SOLID WASTE DENSITY ADJUSTMENT PERCENTAGES

	FEBRUARY BASE	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY
A. Seasonal Weight Proportions												
1. Weekly weight proportions per Metropolitan Toronto	1.70%	1.81%	2.10%	2.06%	2.19%	1.92%	1.96%	2.05%	1.96%	1.98%	1.60%	1.58%
2. Increase/Decrease in Waste from February level.	0	+6.5%	+23.5%	+21.2%	+28.8%	+12.9%	+15.3%	+20.6%	+15.3%	+16.5%	-5.9%	-7.1%
B. Derived % Increase or Decrease in Density Factors:*												
3. Municipal Compacted Waste on Contractors Working for Municipalities	0	+3.5%	+12.4%	+11.2%	+15.2%	+ 6.8%	+ 8.1%	+10.9%	+ 8.1%	+ 8.7%	-3.0%	-3.7%
4. Municipal Loose Waste and Miscellaneous Loads	No adjustment, use weight per load											
5. Private Compacted Waste	0	+2.1%	+7.4%	+ 6.7%	+ 9.1%	+ 4.1%	+ 4.8%	+ 6.5%	+ 4.8%	+ 5.2%	-1.8%	-2.2%
6. Private Loose Waste	0	+4.2%	+15.0%	+13.5%	+18.4%	+ 8.2%	+ 9.7%	+13.1%	+ 9.7%	+10.5%	-3.6%	-4.5%

* Density accounts for a portion only, of total seasonal weight change, the balance being due to change in number of truck loads. The basic density % in B. above was derived for February and May by eliminating the effect of changes in number of truckloads. The density factors were then derived for the other months based on the monthly weight proportions shown in A. above.

TABLE 2

SEASONAL GENERATION OF SOLID WASTE
MONTHLY AND WEEKLY FACTORS

Month	Monthly % Generated*	Days in Month	Weekly % Generated
January	7.0	31	1.58
February	6.8	28	1.70
March	8.0	31	1.81
April	9.0	30	2.10
May	9.5	31	2.06
June	9.4	30	2.19
July	8.5	31	1.92
August	8.7	31	1.96
September	8.8	30	2.05
October	8.7	31	1.96
November	8.5	30	1.98
December	7.1	31	1.60
	100.0%	365	

* Derived from analysis of 4 years of Metropolitan Toronto data (1975-1978)